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MEMORANDUM FOR: Deputy Director for Intelligence

SUBJECT : Proposed Contract with [REDACTED]  
[REDACTED] for a Precise Measurement Study at a Cost of [REDACTED]

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1. This memorandum requests approval for the commitment of funds for a contract. The specific request is stated in Paragraph 6.

2. A fundamental understanding of the errors which occur in the photographic measurement process is essential to NPIC. Errors can result from many sources and are of many different magnitudes. Some occur during the acquisition process itself, due to the geometric characteristics of the camera or the attitude of the taking vehicle. Others occur during the film processing phase, while still others result from the actual measuring on the film. These errors are due to special characteristics of the measuring equipment and from the procedures utilized during the measuring process. Knowledge of these errors is important for three reasons. First, measurements are an integral part of the imagery interpretation process; without reliable measurements, errors in interpretation are possible—mensuration provides objective data to reinforce the essentially subjective process of imagery interpretation. Second, we need to be able to place limits of reliability on our accuracy so that analysts and other users of NPIC reports will know to what extent they can trust the data they work with. Third, if we are to build measuring equipment which is cost effective, and is no more accurate nor expensive than is necessary to fulfill our mission, we must be able to isolate and to understand the major error factors involved. The final mensuration process should be truly commensurate with the limitations of the materials being measured, the human performing the mensurations, and the requirements that the extracted data is ultimately to fulfill.

3. This Precise Measurement Study is designed to isolate these major error factors. Separate elements of the problem have been analyzed previously; however, the problem has never before been tackled in its entirety. All pertinent data from earlier work will be utilized in this study. The proposed program will be made up of the following tasks:

Task 1 - Define specific Problem Areas and Priorities - Contractor and NPIC to establish this within the scope of the available funding.

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Excluded from automatic  
downgrading and  
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Task 2 - Data Bank - (a) Establish a data bank from limited available material to use on this problem. (b) Prepare a program for establishing an extensive data bank to more realistically cover operational conditions.

Task 3 - Error Investigation, to determine the source and magnitude of all errors which might affect measurement accuracy. (a) Acquisition Systems - Calibration of Optics, Geometry of the film, relative orientation, etc. (b) Operational Parameters - Ephemeris information, timing accuracy, atmospheric effects, etc. (c) Photo Processing - Stability of films, image quality of various generations of material, etc. (d) Image Measuring Equipment - Measuring engine accuracy, optical systems, etc. (e) Operator-Instrument Interface - Controls, magnification, illumination, etc.

Task 4 - Error Propagation Study - to determine the effect and significance of the identified errors on the reliability of the results.

Task 5 - In-House Data Reduction - Analysis of math models and computer programs currently in use.

Task 6 - Stereo Mensuration Study - Stereo vs. Mono, stereo vs. ground truth.

Task 7 - Image Quality - Scale, density, contrast, etc.

Task 8 - Detailed System Analysis - (a) Evaluate the results of the previous tasks and other studies in order to provide recommendations for procedures and instrumentation necessary to achieve the precision required in the exploitation processes. (b) Recommend areas requiring further investigation. This study will not duplicate work already done under the Human Factors or Image Analysis Program but will build upon the results of past efforts with the major emphasis in the areas where little has been done, e.g., the acquisition system, error propagation and a data bank. The Precise Measurement Study will be closely coordinated with the Human Factors Program, and the Human Factors Contractor will contribute some support in establishing test procedures.

4. Fourteen contractors were invited to bid on this program and five responded. [redacted] was judged to be the best qualified to accomplish the program. The [redacted] proposal displayed an excellent understanding of the problem and presented a realistic approach to solving it.

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5. This study has been closely coordinated through established internal and external channels, and it has been determined that there is no duplication of effort.

6. It is requested that approval be granted to negotiate with the [ ] for a contract to undertake the Precise Measurement Study at a cost not to exceed [ ]

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ARTHUR C. LUNDHAL  
Director  
National Photographic Interpretation Center

## Attachments: (3)

1. Catalog Form
2. Staff Study
3. Autometric Proposal

APPROVED: [ ]

Date

Deputy Director for Intelligence

## Distribution:

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